

Chapter 8

Towards a Multifunctional Virtual City Model

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ABSTRACT

This chapter examines the challenge of creating and sustaining a virtual city model and illustrates how the success of such efforts may depend on strategic collaborations between multiple organizations. It argues that a city model which is aligned to the development of the real city, to visually and analytically assess urban planning proposals, is more likely to be regularly used, continually updated, authoritative and sustainable in the longer term. A case study is described of Virtual NewcastleGateshead (VNG), a collaboration between a university (Northumbria University) and two neighbouring local authorities (Newcastle City Council and Gateshead Council) in the north east of England, UK, with the aim of developing a financially sustainable three-dimensional (3D) computer model for the purposes of urban planning, education and research. The chapter also summarises associated research which investigates the issues in extending the visualization capabilities of a virtual city model by exploring data interoperability issues related to 3D simulations of the performance aspects of urban spaces, including pedestrian movement, noise mapping, wind modelling and thermal comfort. It proposes that the integration of such simulations into virtual city modeling offers much scope for continued use of city models and future research. Conclusions on this collaborative, integrated approach to sustainable city modeling are included.

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INTRODUCTION

Many cities throughout the world are building, or considering building, their own virtual city models. Whilst much research has been carried out on the diverse technical solutions that can underpin virtual city models, little work has been carried out on the *sustainability* of such models and the more practical issues pertaining to organization and management of 3D virtual city models. It is widely understood that virtual city projects may have a limited life due to technological changes and the relatively short life span of the data that defines them. Whilst there is a range of online 3D mapping and virtual globes currently available, these are of a level of accuracy limited for use in urban and spatial planning purposes, and often lack current, local information. So how can a longer lasting virtual city model be achieved? Whilst instances of the *regular* use of city models in spatial and environmental planning are not widely reported to date, there is evidence that virtual city models are being used for a wide range of other applications. However there is a tendency for such models to be optimised for their intended end purpose, which frequently results in constraining future potential applications and reducing sustainability of the model. So how can city models be flexible retrospectively, regardless of their original drivers, acknowledging that flexibility may increase organically as computer hardware and software continues to evolve over time?

This chapter presents a review of the literature on virtual city model production and an overview of virtual city modelling activities within Europe. It offers a case study in creating a virtual city model for Newcastle upon Tyne and Gateshead in the UK, the model being used primarily to support education, research and urban planning. Virtual NewcastleGateshead is striving to become a multifunctional city model to offer a platform for other applications which require analysis on the urban scale. The chapter analyses issues relating to stakeholder requirements and considers the role

that universities can play in bringing together both the public and private sectors. By examining the VNG initiative and associated research into data interoperability and the simulation of performance aspects of urban space, conclusions and recommendations are made to offer an insight into the potential of multiple organizations and diverse computer simulations to support a sustainable city modeling process.

BACKGROUND

City models worldwide are offering examples of what is now possible to achieve with today's technology, but the choice of options available, in terms of computer platforms, data capture, service providers etc. can be daunting to those starting out in this field. Indeed, several cities around the world have now more than one city model, supporting the argument (Bourdakis, 2008) that not one single type of 3D digital model can be suitable for the wide range of applications demanded from them. Even in cities without a city model to date, many *parts* of the city will have been modeled to support new projects or development proposals, resulting in a jig-saw of 3D models using incompatible computer platforms and diverse scales (Horne, 2009). This can be one of the main economic drivers for the creation of one definitive, regularly updated, multi-functional city model, aimed to be used by multiple stakeholders and sustained over time. Urban planning departments in particular are realizing that many benefits and efficiencies can be gained in using 3D city models to assess the visual impact of proposed developments on surrounding areas. Such models, if used within the development planning process, can also extend participation opportunities for members of the public (Coors & Ewald, 2005; Hudson-Smith, Evans, & Batty, 2005). Hence the concept of multiple 3D city models existing for a single real life city, each with separate desired applications, has been challenged by the possibility of creat-

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